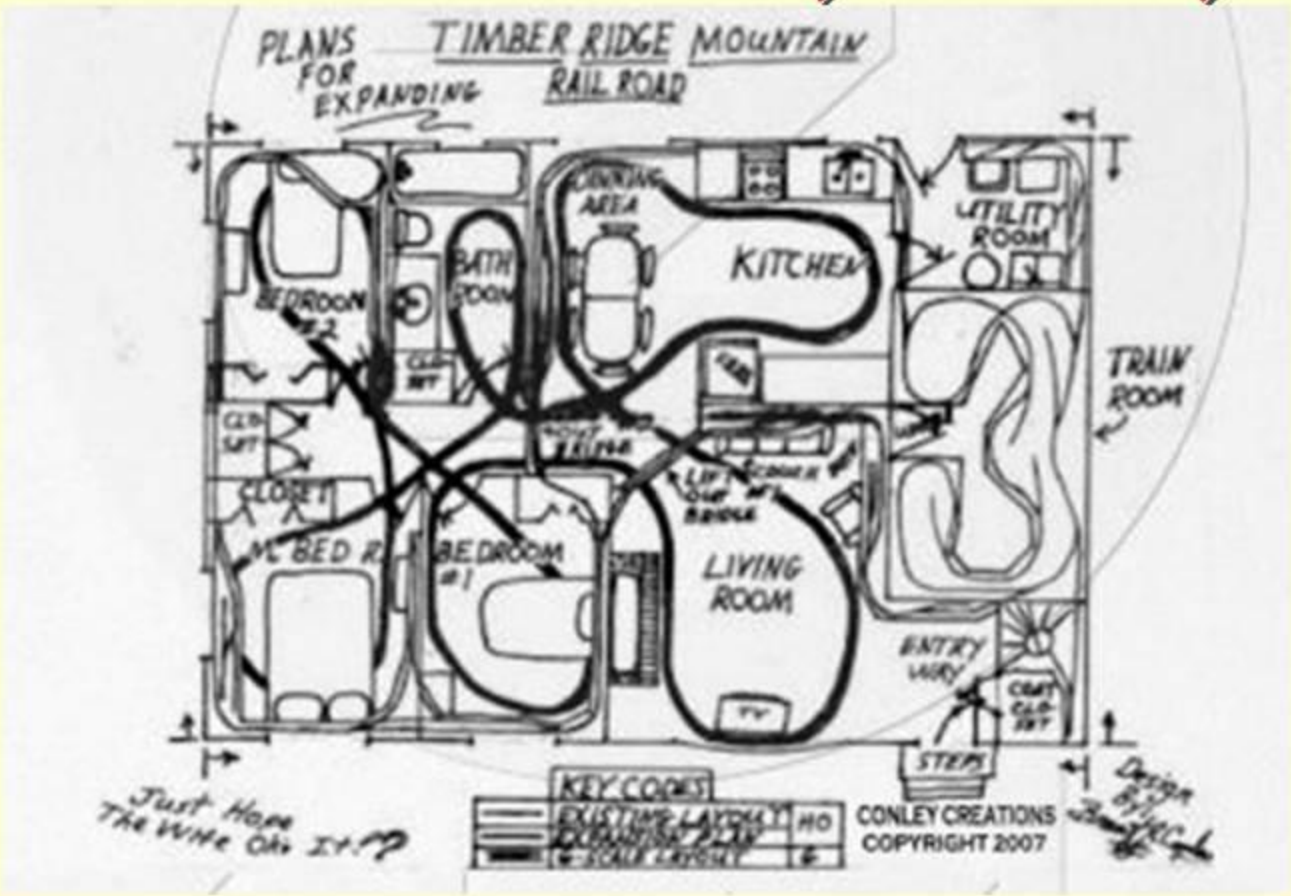
Trinity River Division

MODEL RAILROADING 101

- Planning a Railroad
- Benchwork
- Trackwork
- Electrical
- Scenery
- Structures
- Locomotives
- Rolling Stock
- Painting & Weathering

Trinity River Division

PLANNING A RAILROAD



Trinity River Division

PLANNING A RAILROAD

#1 Scale

Scale	F	G	#1	O	S	HO	TT	N	Z
Ratio	(1:20.3)	(1:22.5)	(1:32)	(1:48)	(1:64)	(1:87.1)	(1:120)	(1:160)	(1:220)
F	**1.000**	1.108	1.576	2.365	3.453	4.291	5.911	7.882	10.837
G	0.902	**1.000**	1.422	2.133	2.844	3.871	5.333	7.111	9.778
#1	0.634	0.703	**1.000**	1.500	2.000	2.722	3.750	5.000	6.875
O	0.423	0.469	0.667	**1.000**	1.333	1.815	2.500	3.333	4.583
S	0.317	0.352	0.500	0.750	**1.000**	1.361	1.875	2.500	3.438
HO	0.233	0.258	0.367	0.551	0.735	**1.000**	1.378	1.837	2.526
TT	0.169	0.188	0.267	0.400	0.533	0.726	**1.000**	1.333	1.833
N	0.127	0.141	0.200	0.300	0.400	0.544	0.750	**1.000**	1.375
Z	0.092	0.102	0.145	0.218	0.291	0.396	0.545	0.727	**1.000**

Trinity River Division

PLANNING A RAILROAD

0-SCALE 1/48

S-SCALE 1/64

HO-SCALE 1/87.1

N-SCALE 1/160

Z-SCALE 1/220

Trinity River Division

G-SCALE 1/22.5

0-SCALE 1/48

S-SCALE 1/64

HO-SCALE 1/87.1

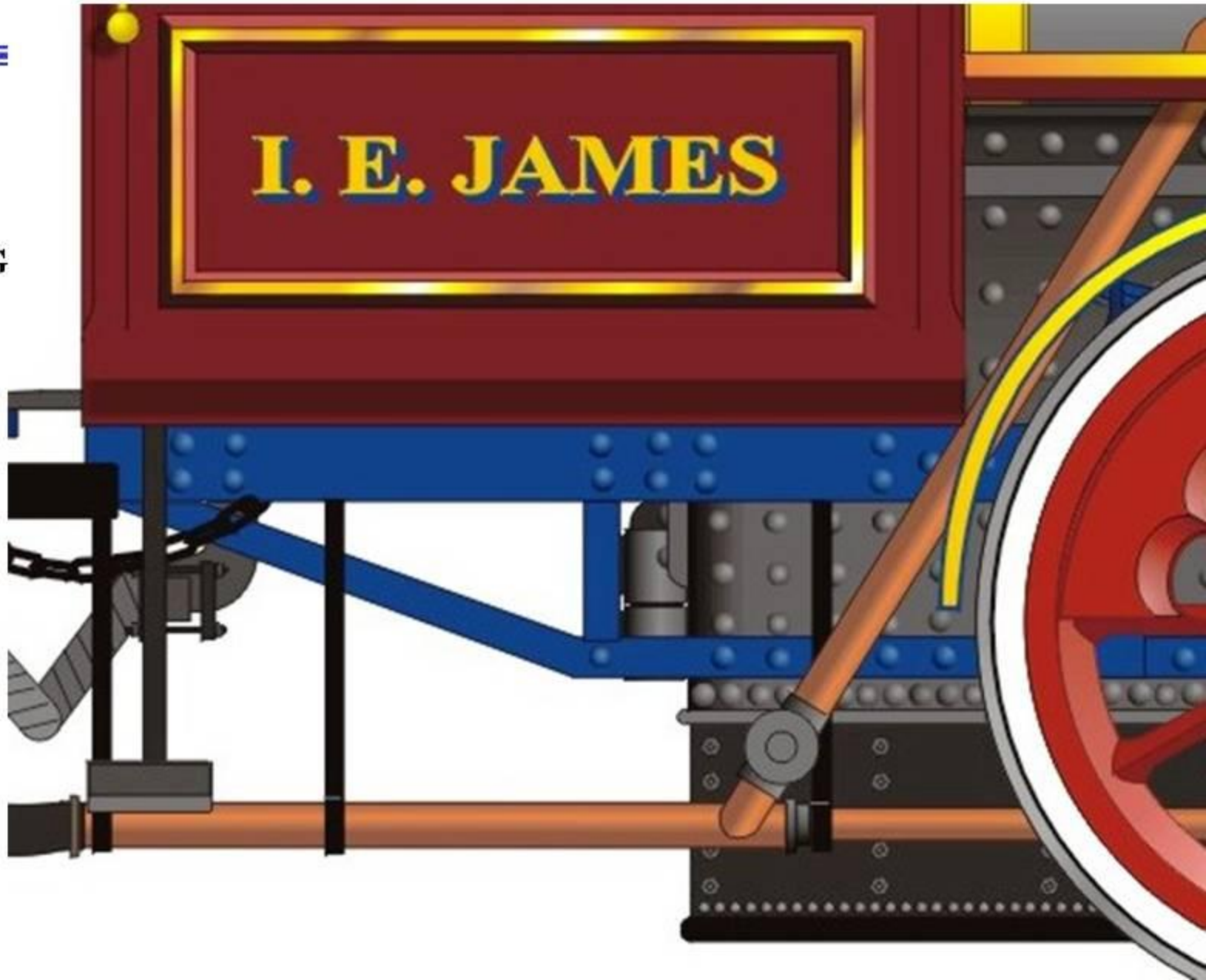
N-SCALE 1/160

Z-SCALE 1/220

Trinity River Division

LIVE STEAM
MODEL
RAILROADING

REAL BIG!



Trinity River Division

PLANNING A RAILROAD

Considerations before you even put pencil to paper

Layout depth

Minimum distance from the edge of the layout

Viewing or Operations

Around the wall or free standing

Single or multiple track mainline

Minimum Isle space

Locomotive power

Permanent or Modular

Single level or multiple

Duck Under or Walk in

Maximum grade

Purpose for the railroad

Minimum crossing height

Lighting

Minimum turn radius

Layout height

Prototype or Freelance

Minimum distance from backdrops

Backdrops

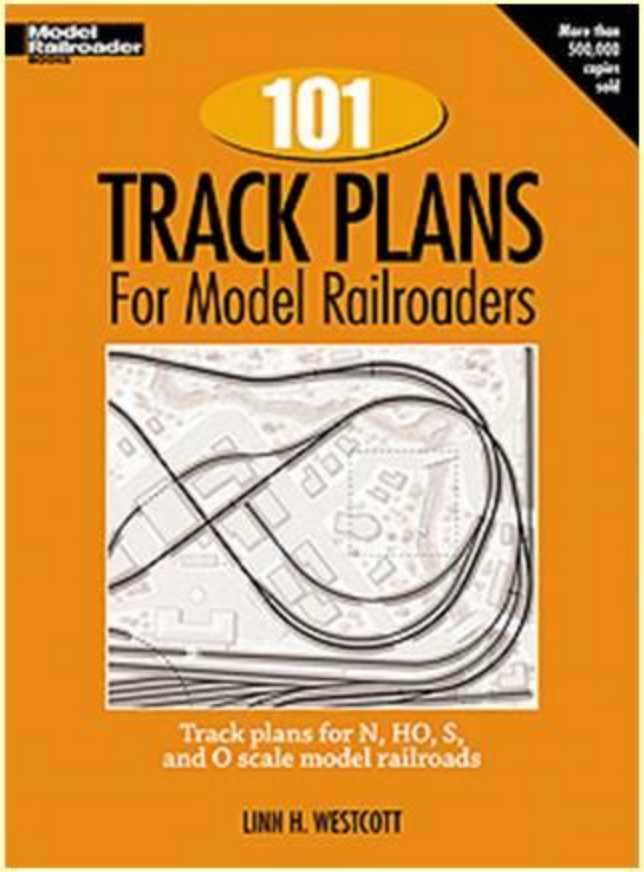
Turnout sizes

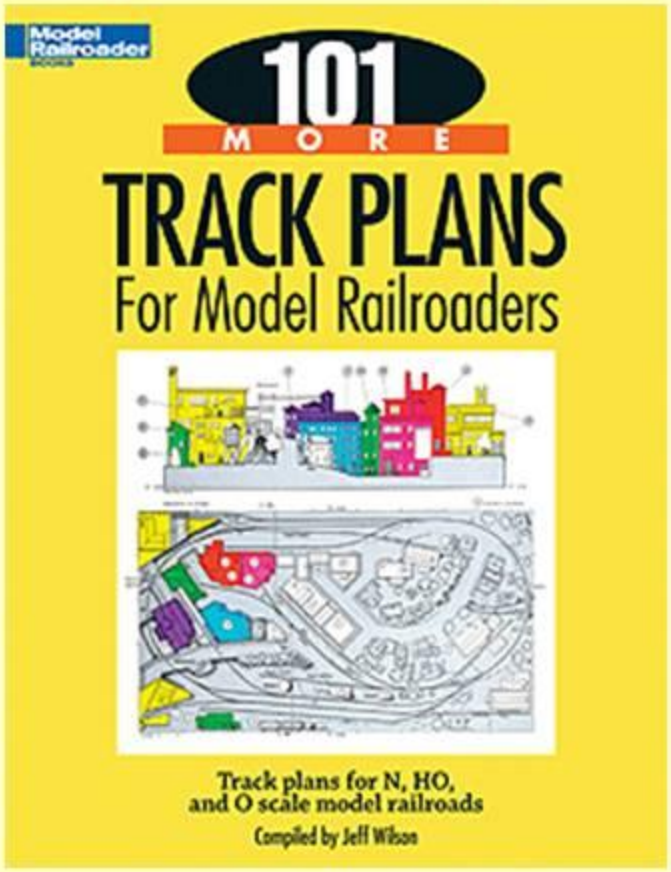
Era of the railroad

Minimum distance between tracks

Trinity River Division

PLANNING A RAILROAD

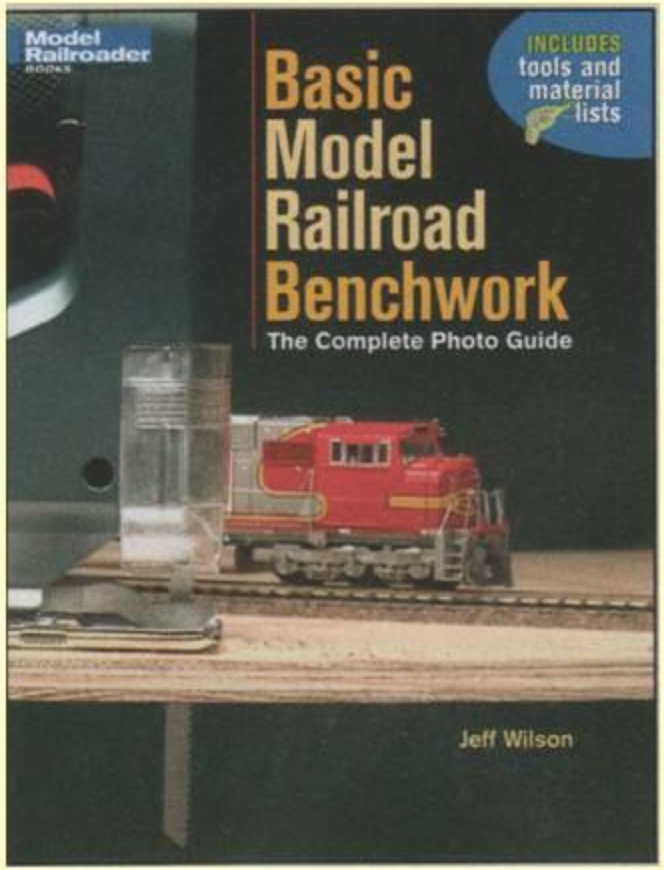




Trinity River Division

PLANNING A RAILROAD

BENCHWORK



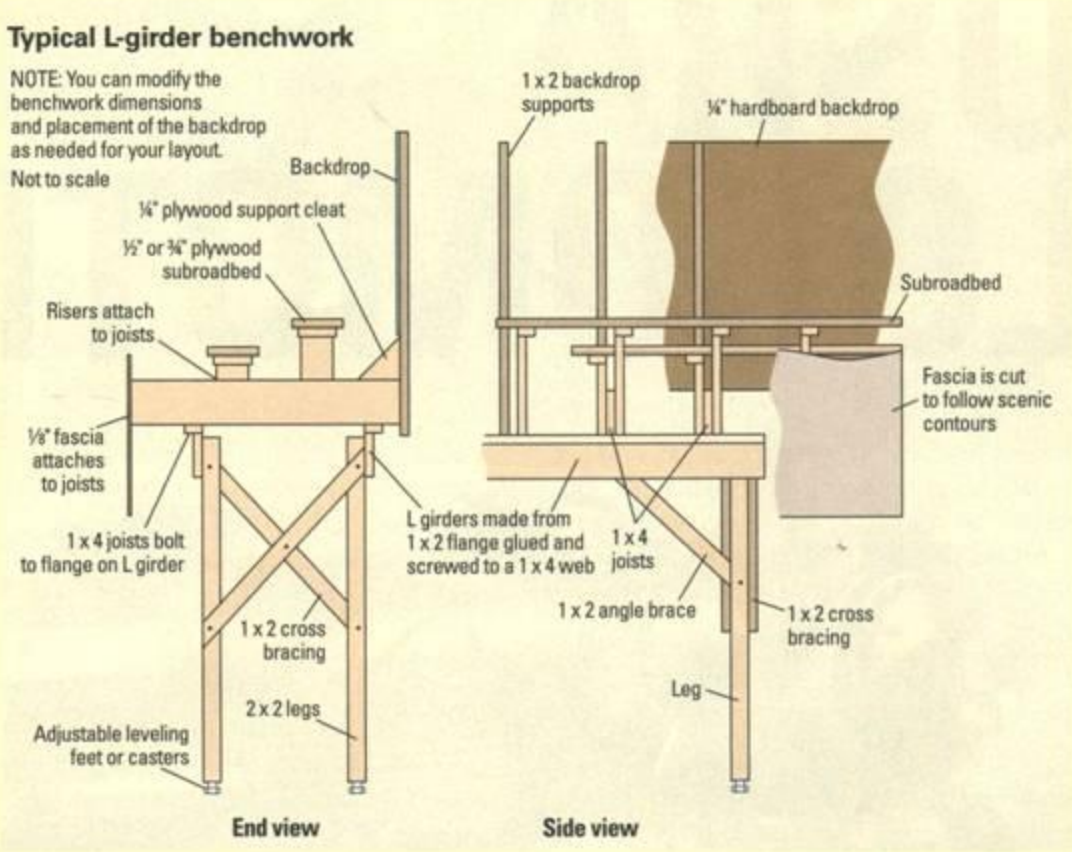
Benchwork means all that stuff under the layout that holds it up so you're not sitting on the floor running your trains.

Trinity River Division

SIMPLE BENCHWORK

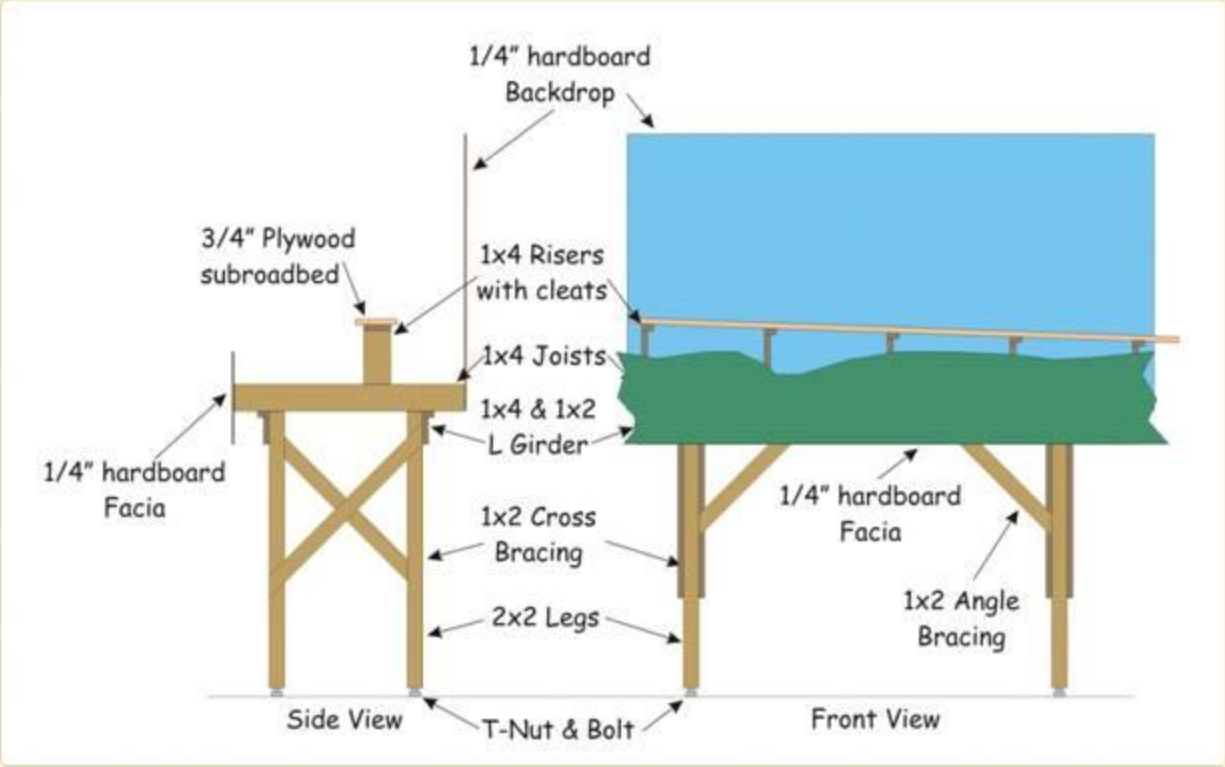
Trinity River Division

TYPICAL BENCHWORK


Typical L-girder benchwork
NOTE: You can modify the benchwork dimensions and placement of the backdrop as needed for your layout.
Not to scale
Backdrop
¼" plywood support cleat
½" or ¾" plywood subroadbed
Risers attach to joists
⅛" fascia attaches to joists
1 x 4 joists bolt to flange on L girder
1 x 2 cross bracing
2 x 2 legs
Adjustable leveling feet or casters
End view
1 x 2 backdrop supports
¼" hardboard backdrop
Subroadbed
Fascia is cut to follow scenic contours
L girders made from 1 x 2 flange glued and screwed to a 1 x 4 web
1 x 4 joists
1 x 2 angle brace
1 x 2 cross bracing
Leg
Side view

Trinity River Division

L-GIRDER BENCHWORK

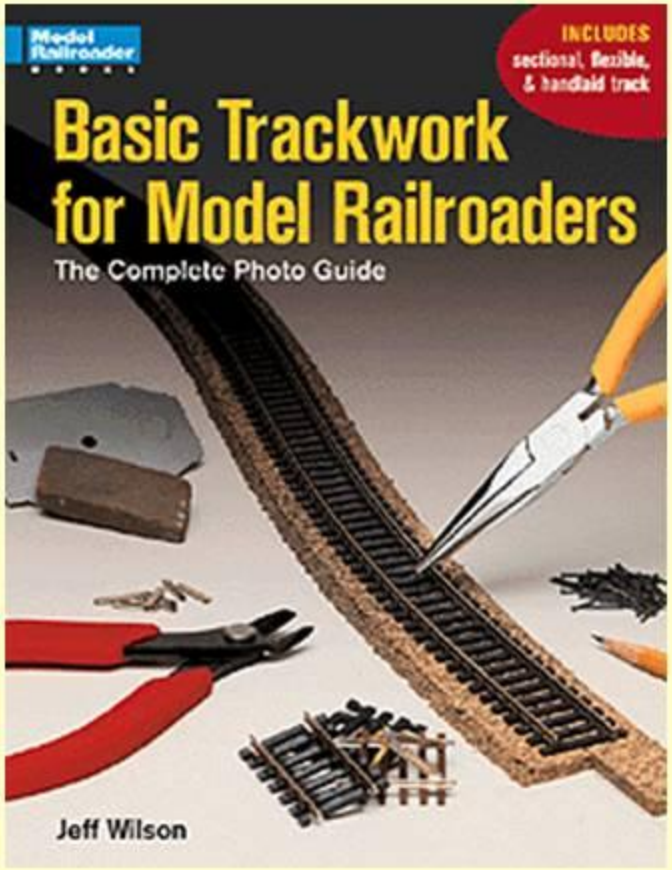


Trinity River Division

TRACKWORK

Trackwork as the name implies deals with railroad track and all of it's pieces.

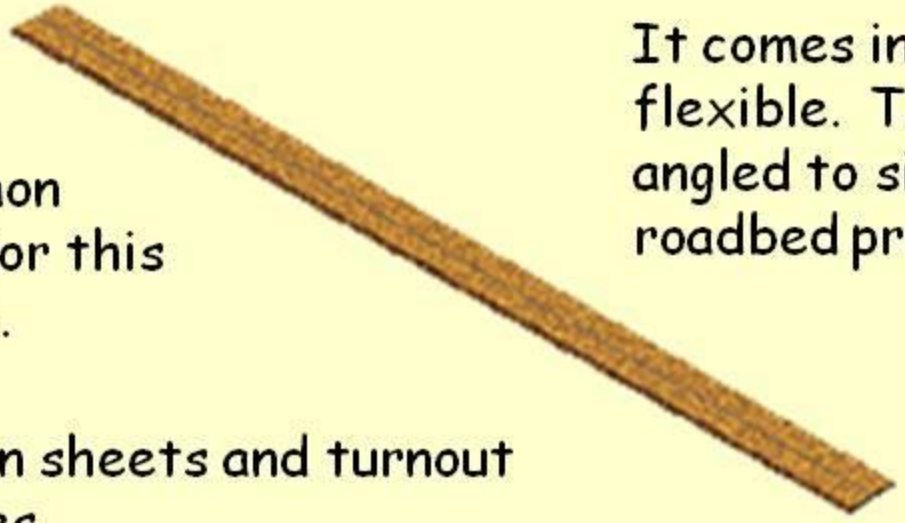
This includes:
- Roadbed
- Track
- Joiners
- Spikes
- Specialty Track
- Turnouts
- Ballast



Trinity River Division

ROADBED

Roadbed is used to not only give the appearance of prototypical right of way grading but provides sound deadening and a medium for track spikes to grab onto to hold the track in place.



It comes in 3′ lengths and is flexible. The edges are angled to simulate a typical roadbed profile.

The most common material used for this purpose is **cork**.

It also comes in sheets and turnout template shapes

Trinity River Division

ROADBED

Another commonly used product is **Homosote**. Homosote comes in 4x8 sheets and is generally ½" thick. This is a paper product used in construction and can be found at some hardware stores. The problem with this material is that it is not real consistent in thickness between sheets and it is susceptible to swelling if it gets wet.

An alternative to Homosote is **Micore**. This also comes in 4x8 sheets but is more consistent and is not susceptible to swelling. The problem with this product is that it is more difficult to find.

Another product is 2x4 **ceiling tiles** turned upside down. This is easy to find and consistent but is susceptible to swelling.

Trinity River Division

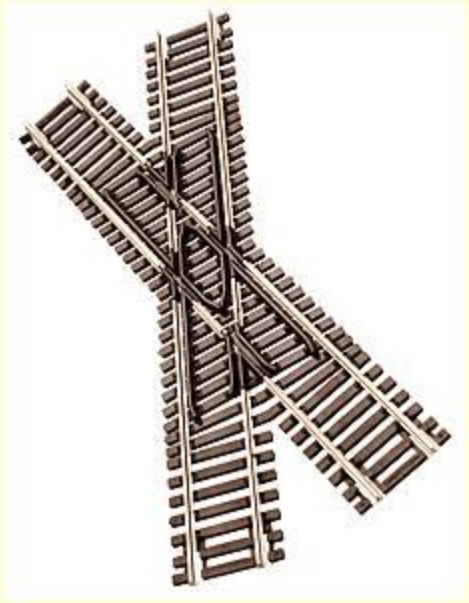
TRACK

Just like roadbed, there are several different kinds of **TRACK** products to consider.

Sectional Track

EZ-Track

Flex Track



Specialty Track

Hand Laid

Trinity River Division

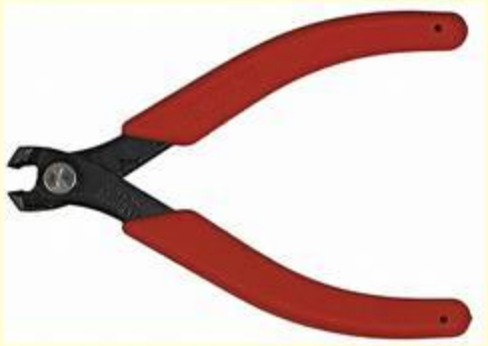
TRACK

Other items you'll need to lay down your track include:

Track Spikes

Rail Joiners

Track Nails



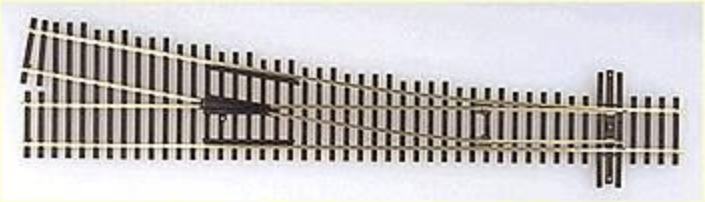
Rail Cutters

Pliers

Trinity River Division

TURNOUTS

Then you'll want to add turnouts to give alternate routes for your trains.



Standard Turnout

Wye Turnout

Curved Turnout

3-Way Turnout or "Crows Foot"

Double Slip

TURNOUT CONTROL

There are several methods for actually moving a turnout

Most commonly used Tortoise Stall Motor

Twin coil on a Rix mount

Ground throws

Atlas switch mounted throw

Trinity River Division

BALLAST

...and then when it's all in place you add the Ballast

Trinity River Division

BALLAST

...and then when it's all in place you add the Ballast

Trinity River Division

BALLAST

...and then when it's all in place you add the Ballast

few drops

"wet water"

Trinity River Division

BALLAST

...and then when it's all in place you add the Ballast

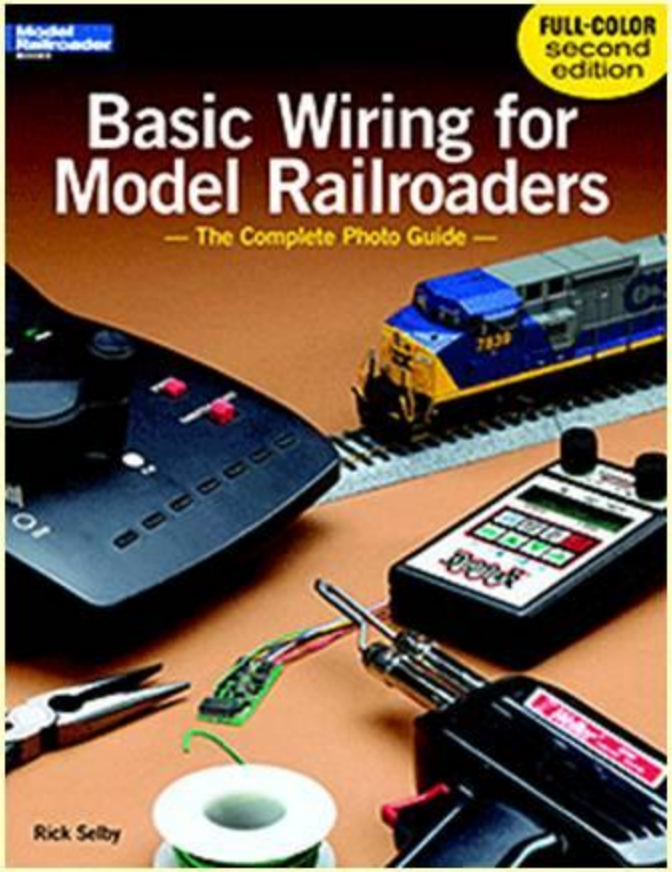
50/50

BALLAST

...and then when it's all in place you add the Ballast

NOTE: While ballasting is covered here under "Trackwork" it is normally not done until all the "Electrical" is done and everything is operating correctly. It is normally applied while doing "Scenery".

ELECTRICAL



ELECTRICAL - Obviously this is what makes the trains run.

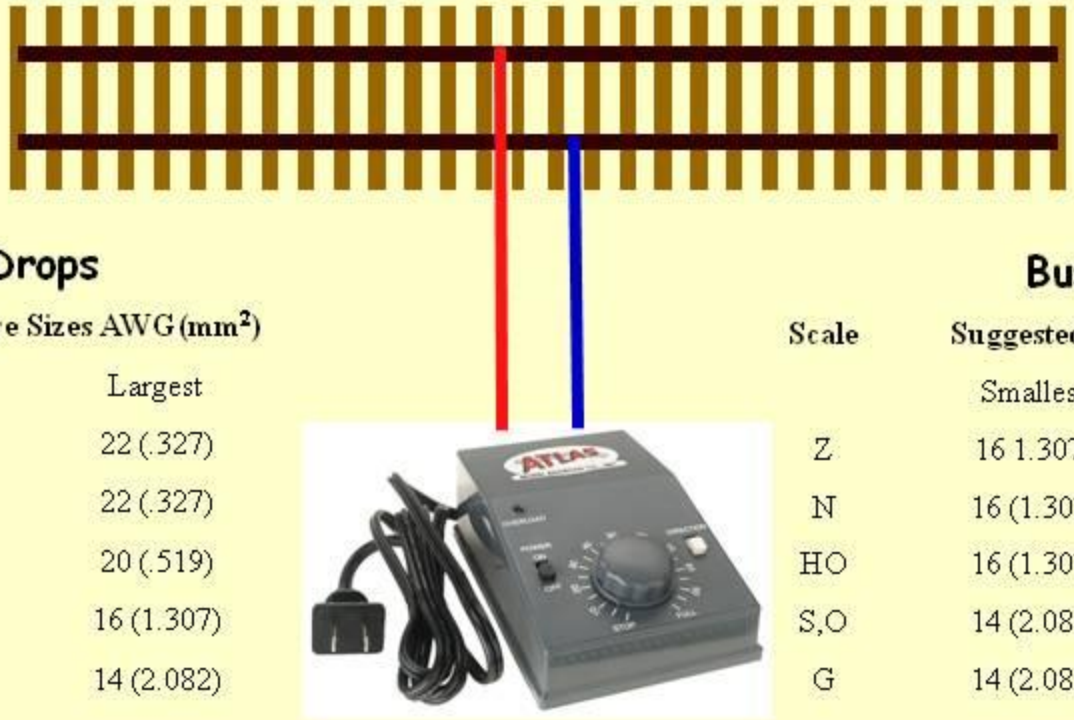
Let's take a look at:

- Basic wiring track wiring
- Direct Current (DC) control
- Digital Command and Control (DCC)

Trinity River Division

BASIC TRACK WIRING

The most basic track wiring is to run 2 wires from a power pack to the track -- doesn't matter if its straight DC or DCC



Track Drops

Scale	Suggested Wire Sizes AWG (mm²)	
	Smallest	Largest
Z	24 (.205)	22 (.327)
N	24 (.205)	22 (.327)
HO	24 (.205)	20 (.519)
S,O	22 (.327)	16 (1.307)
G	20 (.519)	14 (2.082)

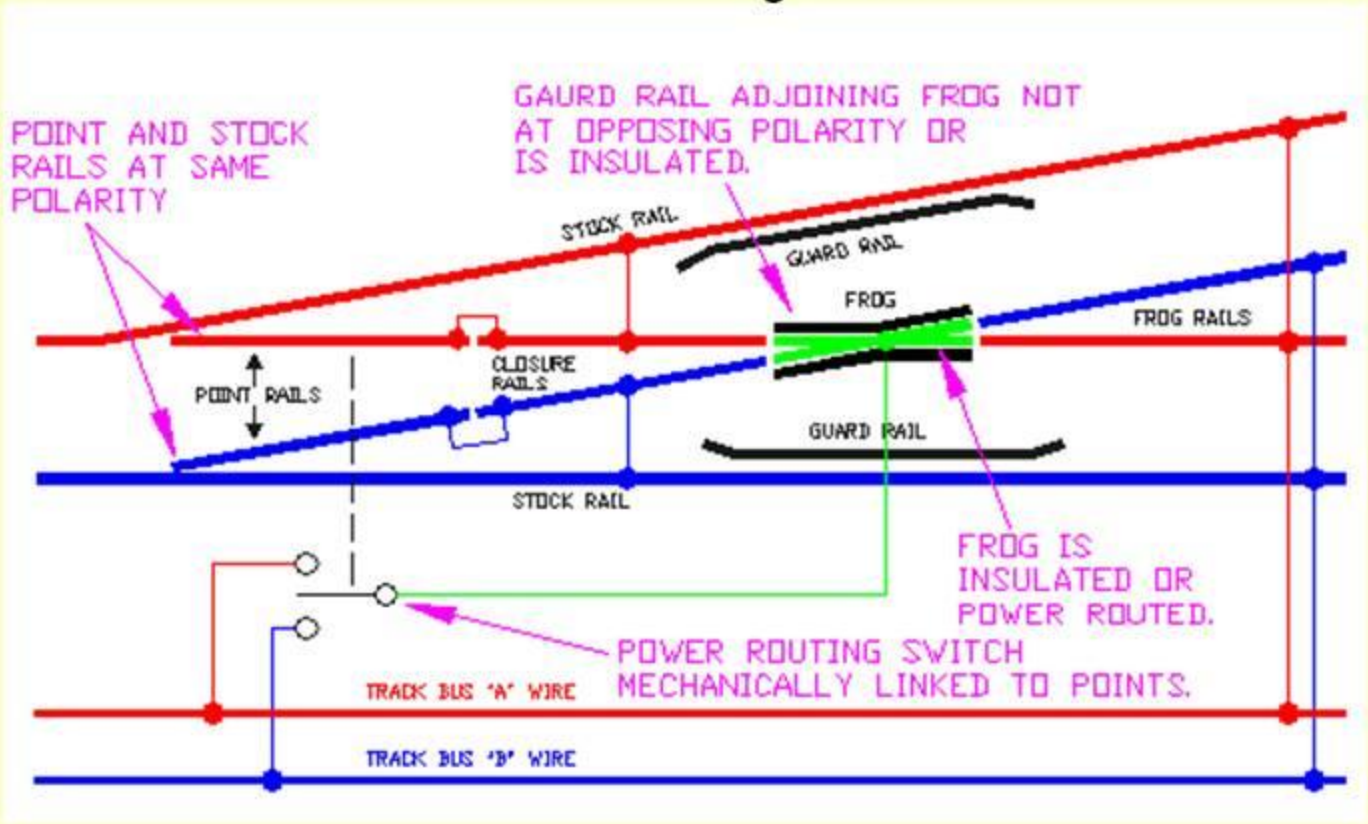
Bus Wire

Scale	Suggested Wire Sizes AWG (mm²)	
	Smallest	Largest
Z	16 1.307)	14 (2.082)
N	16 (1.307)	14 (2.082)
HO	16 (1.307)	12 (3.307)
S,O	14 (2.082)	10 (5.260)
G	14 (2.082)	10 (5.260)

Trinity River Division

TURNOUT WIRING

What about wiring turnouts?



Trinity River Division

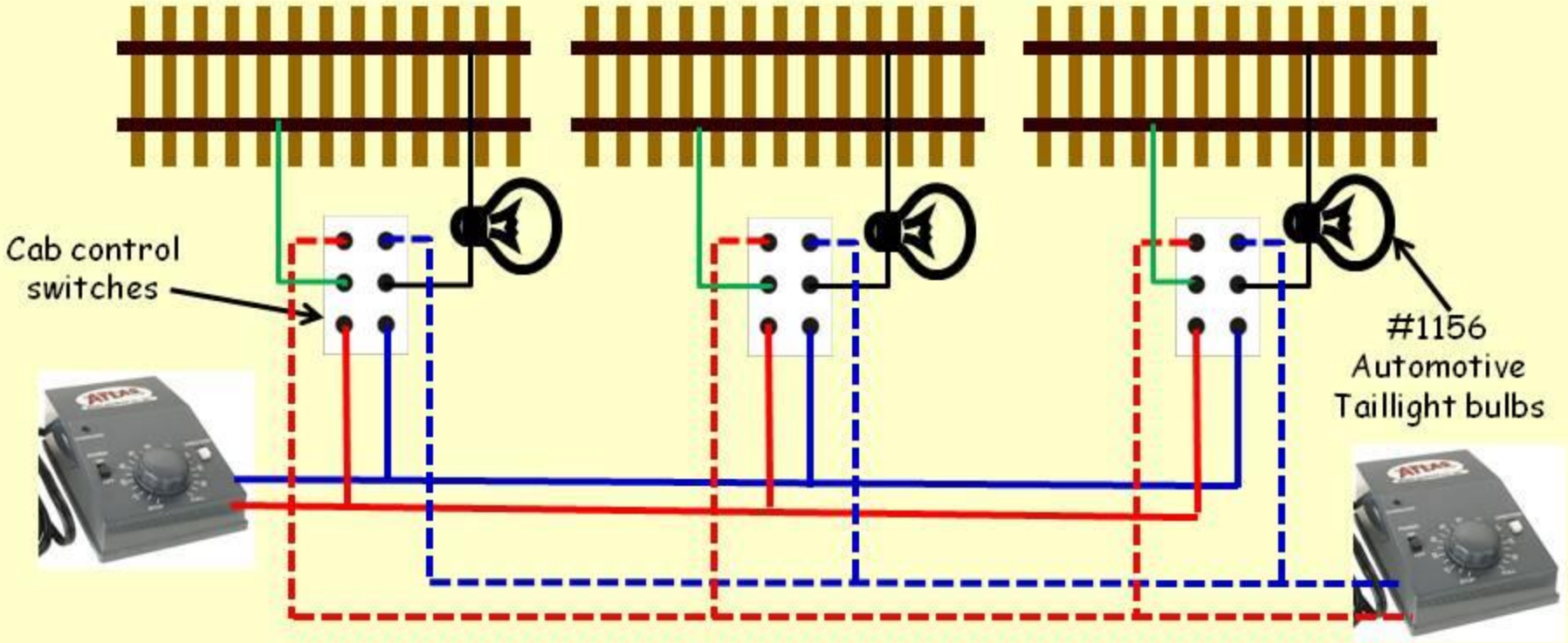
BLOCKING BASICS

Once you go beyond the basic oval track plan you want to consider "blocking" the electrical connections

Trinity River Division

BLOCKING BASICS

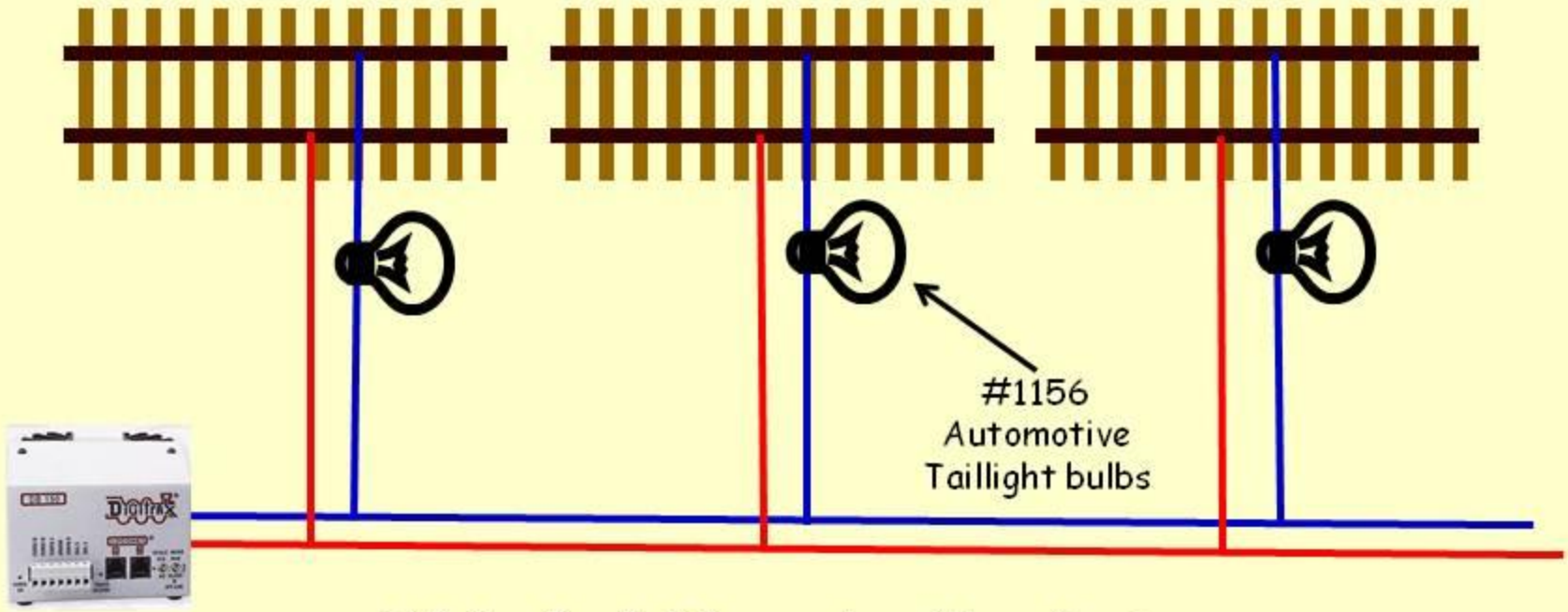
Once you go beyond the basic oval track plan you want to consider "blocking" the electrical connections



Trinity River Division

WIRING FOR DCC

What about DCC?



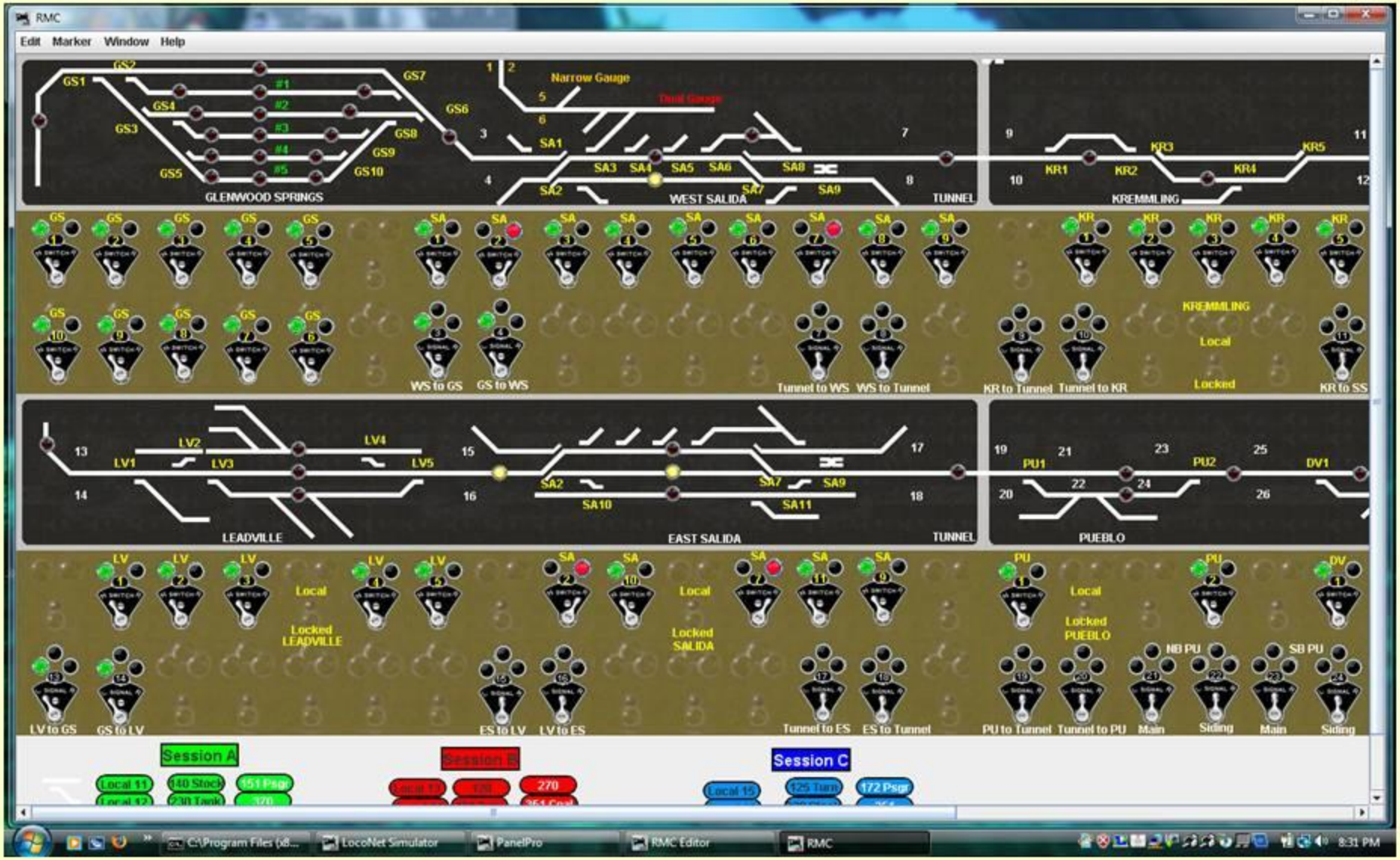
WiringforDCC.com by Allan Gartner

OTHER ELECTRICAL

Sooooo, you think we're done with electrical now right?
Wrong, there's a whole lot more that you could do if you want to:

Building and Street lights
Locomotive lighting
Passenger Car lighting
Caboose or "FREDs" lighting
Day/night lighting
Overhead layout/room lighting
Special lighting effects such as fires, welding, flashing police light
Sound effects
Signals
Computer control of turnouts and signals

Trinity River Division



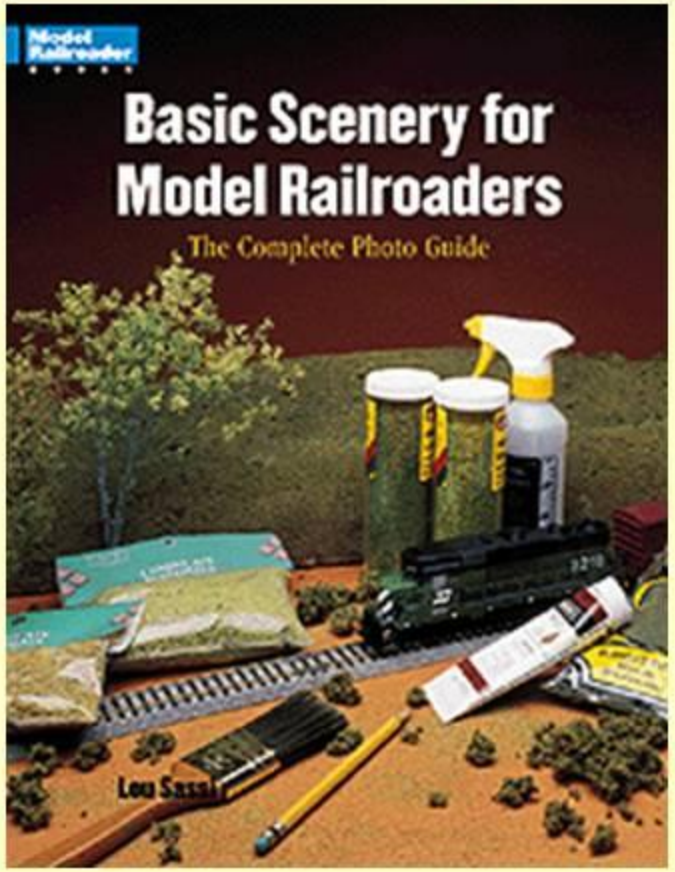
Trinity River Division

SCENERY

SCENERY - This is what turns a flat plywood board with track on it into a miniature world.

Let's take a look at:

- Basic Terrain
- Tunnels
- Basic ground cover
- Trees and Bushes

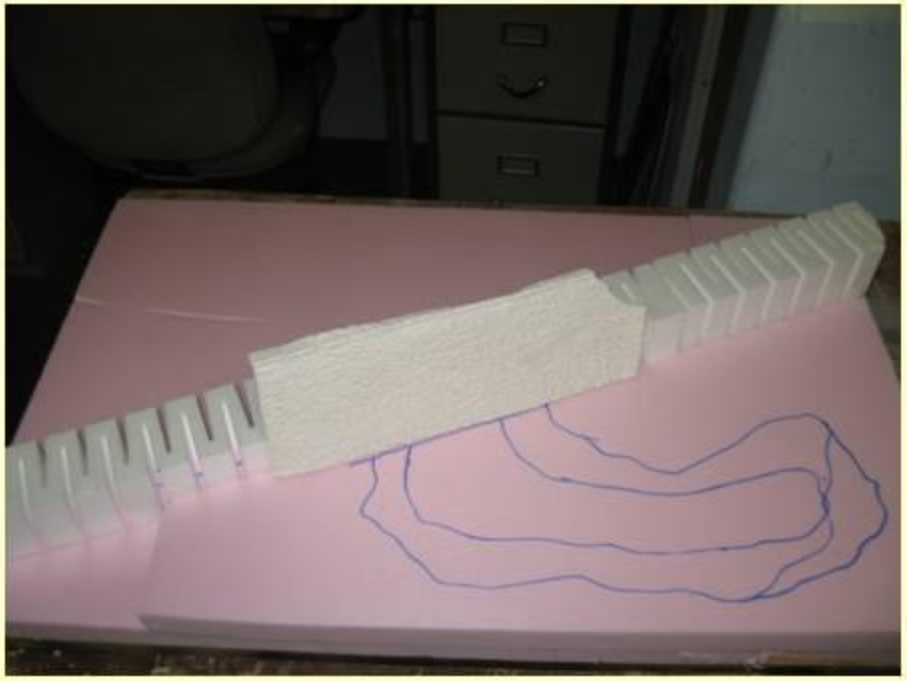


BASIC TERRAIN

Terrain can be flat, rolling hills, rivers, lakes, tall mountains and deep gorges, waterfalls, city scapes or just about anything else that fits the area you are trying to model.

BASIC TERRAIN

...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.

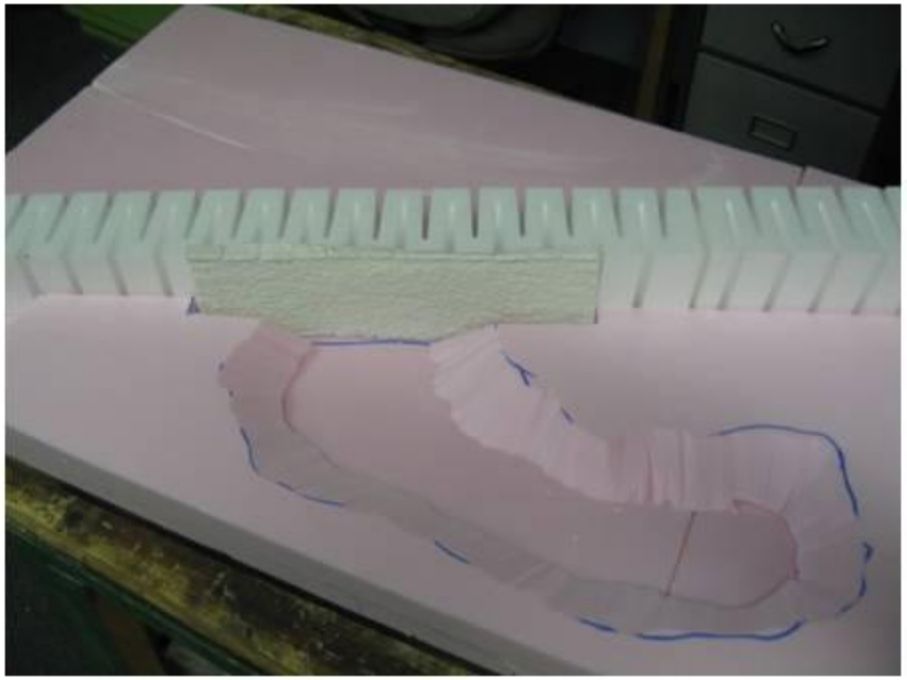


Cut a piece to fit the area then mark where you want the terrain features to be

BASIC TERRAIN

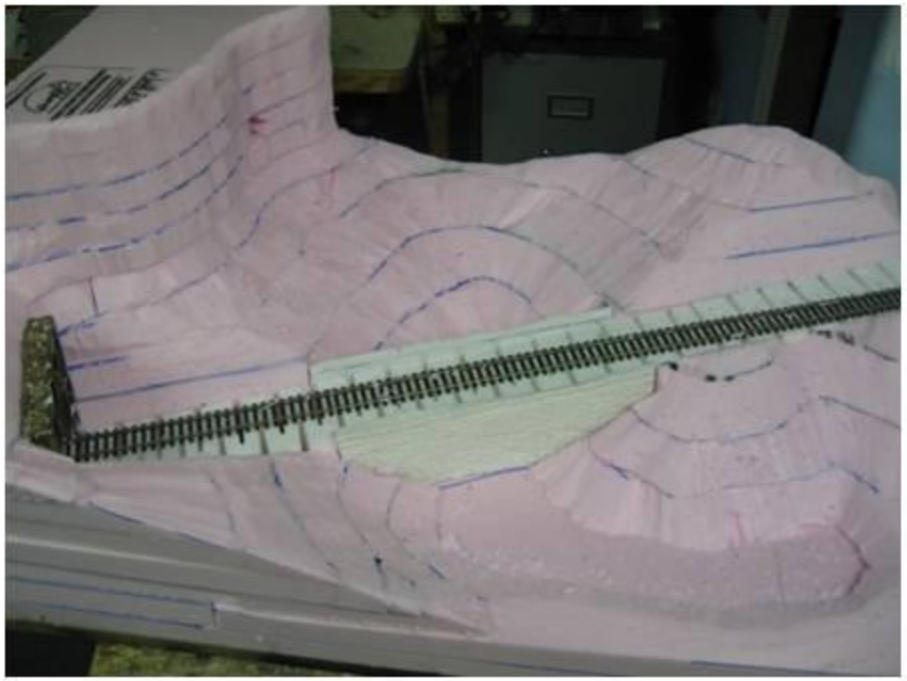
...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.

Cut to follow the terrain then glue in place.



BASIC TERRAIN

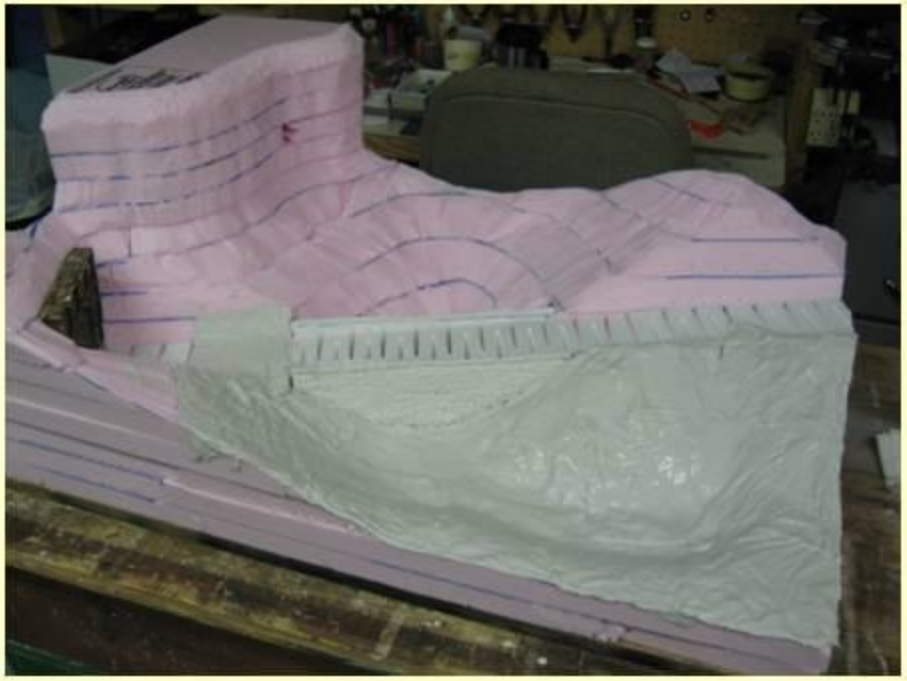
...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.



Continue building the terrain up until you have the desired effect

BASIC TERRAIN

...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.



Start at a low point and begin covering the area in plaster soaked paper towels, overlapping slightly as you go.

BASIC TERRAIN

...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.

Continue until the entire area is covered.

BASIC TERRAIN

...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.

Using rock molds apply a rock surface to the cliff face

BASIC TERRAIN

...and there's as many ways to build the terrain as there is types of terrain. Let's take a look at using foam insulation board to build up the terrain.

Continue adding wet molds until the entire cliff face is covered. Then blend the rocks together using sculptamold.

BASIC GROUND COVER

Once that has dried, repeat the process this time with different grasses

BASIC GROUND COVER

Once that has dried, repeat the process this time with different grasses

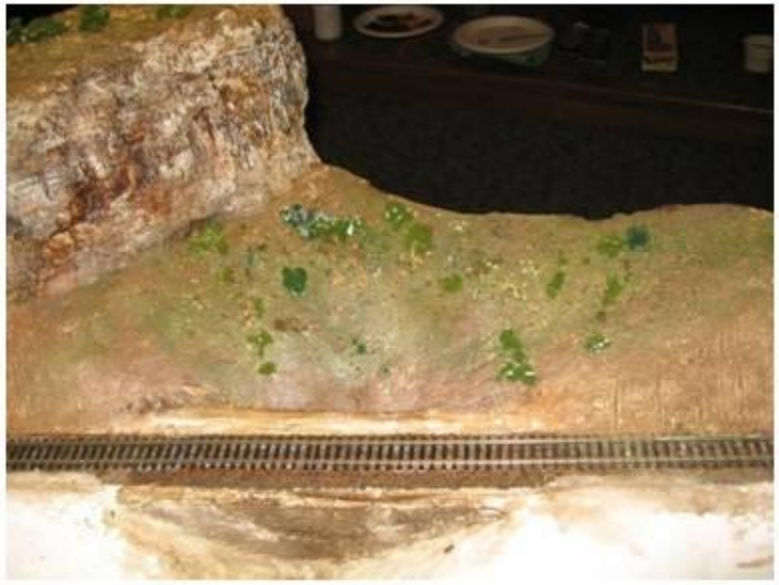
Trinity River Division

ADD SOME BUSHES

Right on top of the still wet grasses you can add some "course" ground foam as small bushes and then some "clump" foam as larger bushes. You can also add twigs, rocks, wild flowers to add a bit more color.

ADD SOME BUSHES

Right on top of the still wet grasses you can add some "course" ground foam as small bushes and then some "clump" foam as larger bushes. You can also add twigs, rocks, wild flowers to add a bit more color.



Trinity River Division

TREES

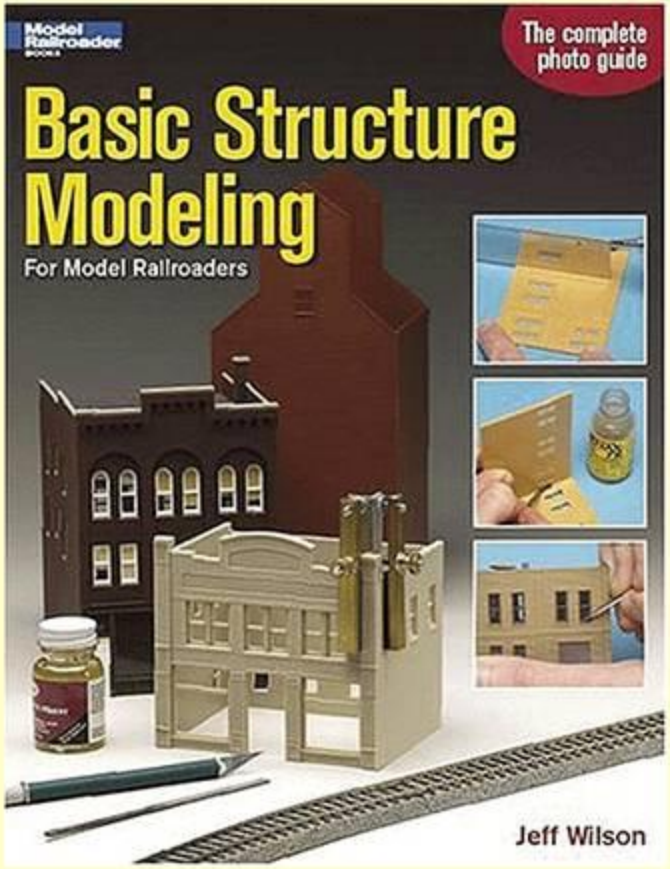
Trees, Trees, and more Trees you can never have too many trees.

Use a variety of trees that would be found in the area you are modeling

Plant them in "odd" numbers.

Trinity River Division

STRUCTURES



STRUCTURES - This includes all the "man-made" items on your railroad from giant skyscrapers to a rural outhouse. Bridges and Trestles also fall into this category.

Let's take a look...

STRUCTURES

Typical materials:

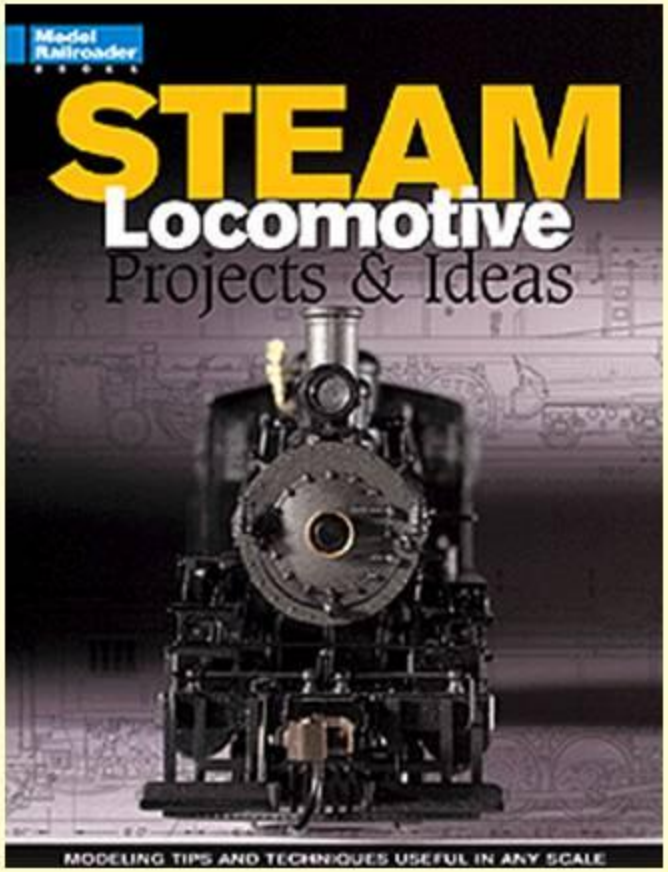
- Styrene (plastic)
- Wood
- Cardstock
- Plaster
- Resin

Typical categories:

- Ready made
- Kit built
- Kitbashed
- Craftsman kits
- Scratch built

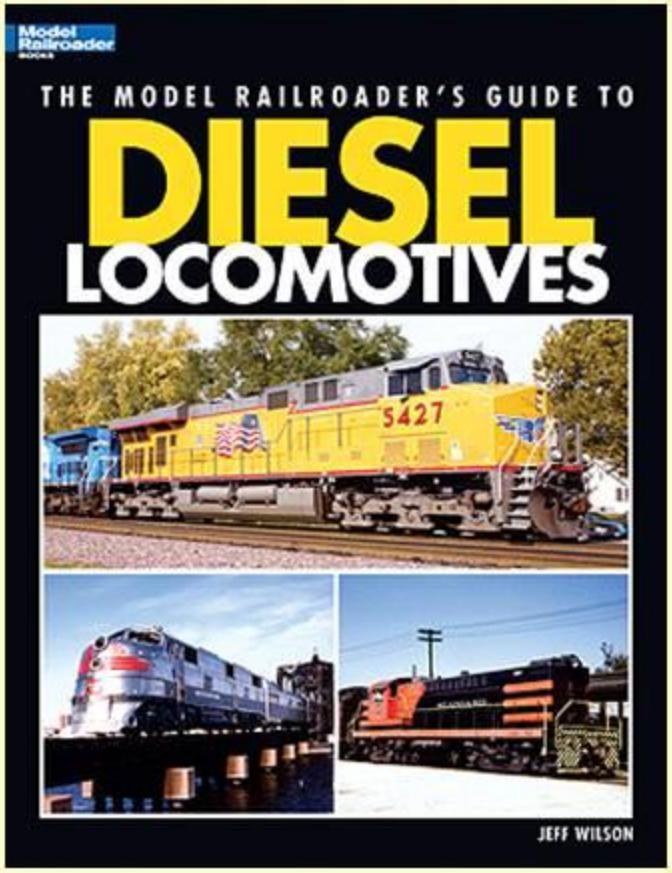
Trinity River Division

LOCOMOTIVES



Locomotives

What kind of locomotive you run will set the era and be part of the determining factor in minimum radius and minimum turnout size.



LOCOMOTIVES

What type of Locomotives to get

Steam? Diesel? or Both?

Steam was the primary motive power until the early 1900s

Transition era was the 1940s and 1950s

After that Steam was relegated to "excursion" specials

and tourist attractions

How about geared steam locomotives such as

the Shay or the Heisler

Trinity River Division

LOCOMOTIVES

What size of Locomotives to get

Typical new layouts are small radius layouts and require small radius engines...

Trinity River Division

LOCOMOTIVES

What size of Locomotives to get

Larger layouts can accommodate much larger engines

Because you can use larger radius curves...

LOCOMOTIVES

Other things to consider

Is it DCC ready or already come with DCC installed

Plastic model or Brass

New or Used

Fit the Era you are modeling

It's worth a little more $ to get a smooth runner

LOCOMOTIVES

For good smooth, consistent operation of your locomotives it's HIGHLY recommended that you set up a Routine maintenance schedule.

Clean wheels & pickups

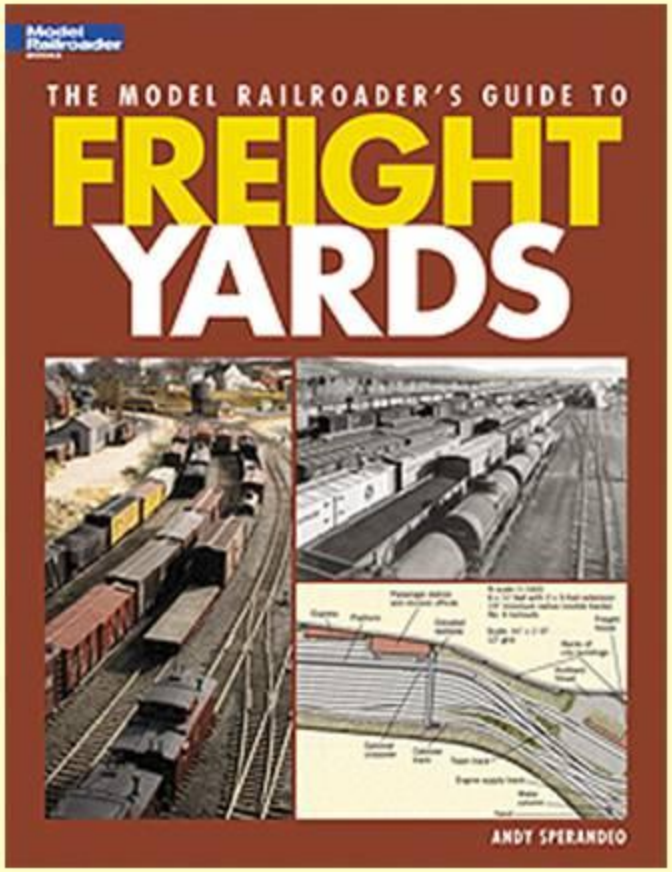
Lube gears and bearings (sparingly!)

Check coupler heights and operation

Inspect electrical connections

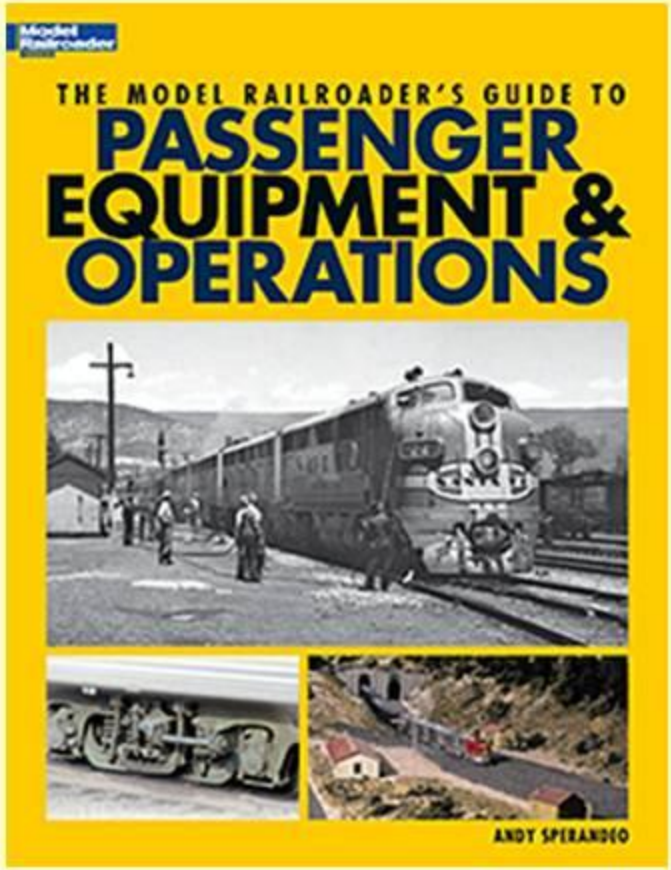
Trinity River Division

ROLLING STOCK



Rolling Stock

The types and numbers of cars you have on the layout dictates what industries you add and what kind of servicing facilities you may want to model.



ROLLING STOCK

Specific cars for specific eras (wood in old cars-- steel in new cars.)

Technology specific cars (example: steel, chemical, automobile industries, etc)

Narrow gauge cars vs. Standard gauge cars

Most cars today are "ready to run" instead of kits

Amazing detailing on cars of today compared to older models

Why are these things important to the look of a layout?

Trinity River Division

ROLLING STOCK

Cars define what the railroad does

Trinity River Division

ROLLING STOCK

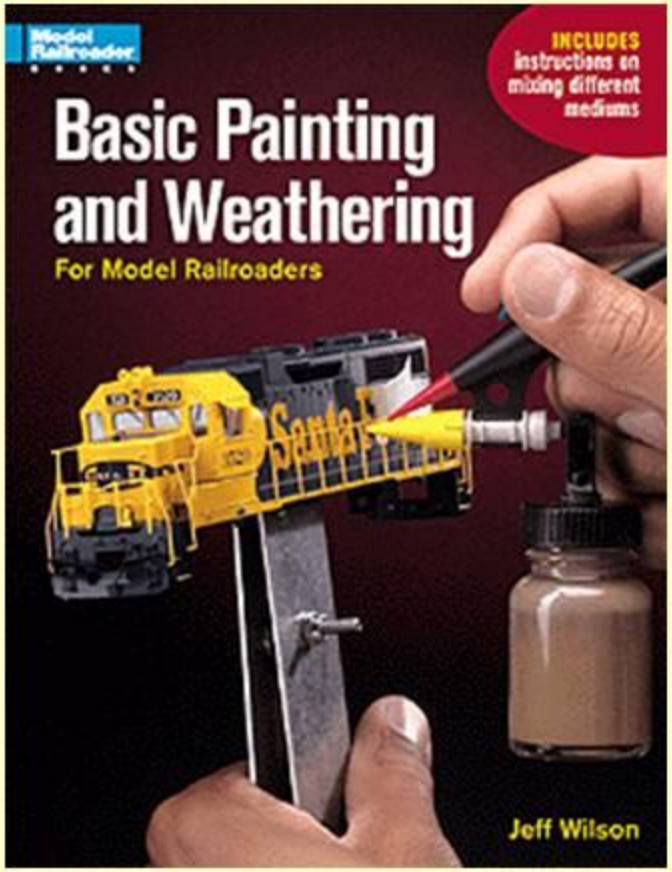
They also define who the railroad is

Trinity River Division

PAINTING & WEATHERING

Painting and Weathering -

This is what pulls everything together and takes something that looks like a model and makes it part of a miniature world.



Trinity River Division

PAINTING & WEATHERING

Trinity River Division

PAINTING & WEATHERING

Painting

You will want to use a variety of techniques from plain old brush painting to spray cans to airbrushing.

You will want to use different types of paint, oils, enamels, acrylics, water colors, etc.

It all depends on the desired affect.

Weathering

This means using any method that works to make a model look like it has been there a while and is not straight from the factory.

Some of the materials include:

Airbrushing
Chalks
"Rust-n-Dust"
India Ink
Plain old dirt

Trinity River Division

QUESTIONS?